

National Weather Service River Forecast System

**NWS Workshop on Hydrologic Forecasting
Prague Campus
Czech University of Agriculture
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David Brandon

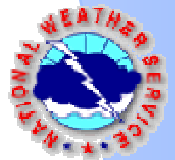
Hydrologist in Charge

Colorado Basin River Forecast Center
National Weather Service



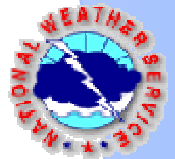
NWSRFS Defined

“ A comprehensive set of integrated hydrologic techniques used by National Weather Service River Forecast Centers to perform their hydrologic forecast functions.”



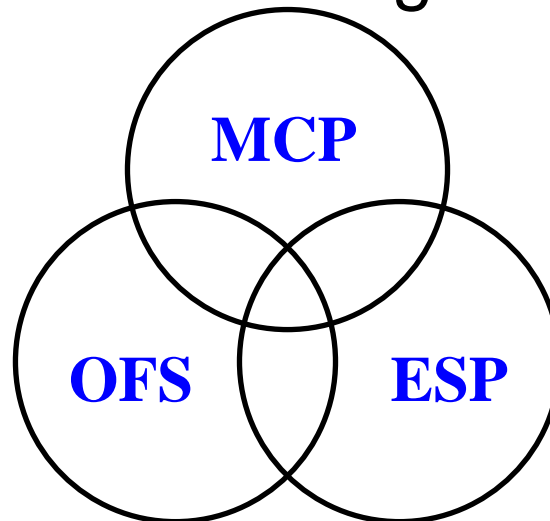
NWSRFS Described

- Offers a variety of modular hydrologic models and computational operations.
- Main Components are:
 - process-based or conceptual
 - continuous
 - lumped in space and time



NWSRFS Described

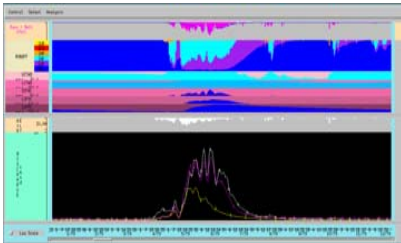
- Operates in 3 integrated modes.
 - Calibration <== parameter estimation
 - Operational <== short term forecasts
 - Ensemble <== longer term forecasts



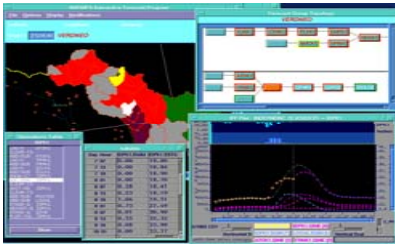
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Three Interconnected Components

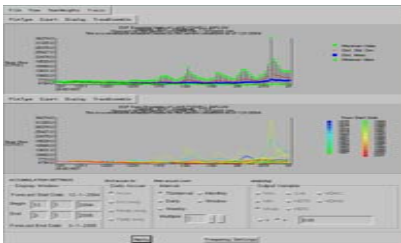
Forecasts For Hours To Seasons



1 Calibration System
Interactive Calibration Program



2 Operational Forecast System
Interactive Forecast Program



3 Ensemble Streamflow Prediction System
ESP Analysis/Display Program



Time and Space

- Time steps
 - Can be 1, 3, 6, 12, or 24 hour.
- Basin areas from 75 km² - 5000+ km².
- Mountainous watersheds typically subdivided into two or more elevation zones.



A Collection of Models and Processes

Simulate Snow – Accumulation and Ablation

Compute Runoff Using Soil Moisture Models

Distribute Runoff In Basin

Route From Basin and Through Channel

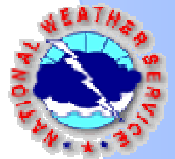
Reservoir Operations

Data Management



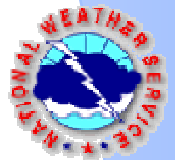
Other Operations

- Routing (hydrologic/hydraulic).
- Artificial regulation.
 - Reservoirs, diversions, consumptive use.
- Stage - discharge conversion.
- Observed - simulated/forecast blending.

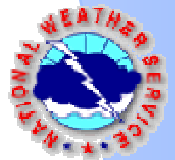
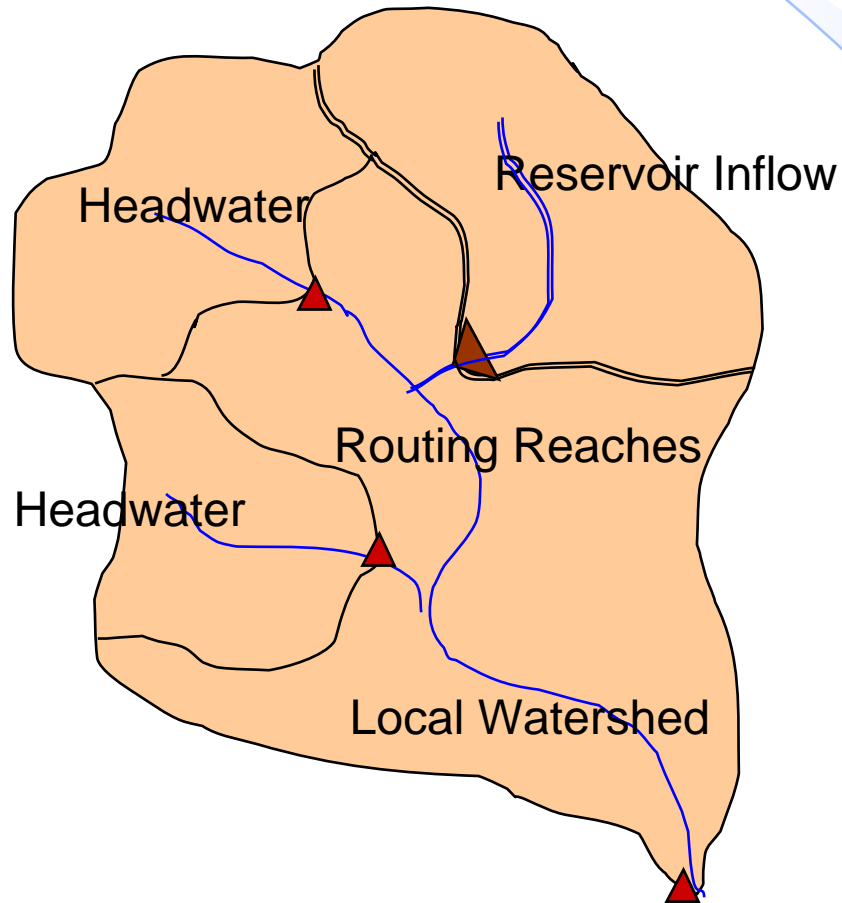


Other Operations

- Arithmetic.
 - Add/subtract, average, time-shift
- Analysis and display.
 - Statistical sampling
 - Summarization
 - Graphical display



Typical River System Configuration



Processing IFP Operations Table Display

Parameters for Operation SAC-SMA HEAC1L

Control

SACRAMENTO SOIL-MOISTURE ACCOUNTING OPERATION FOR HEALDSBURG LOCAL
COMPUTATIONAL TIME INTERVAL IS 6 HOURS.
TIME SERIES USED BY THIS OPERATION.

CONTENTS	I.D.	TYPE	TIME INTERVAL
RAIN+MELT	HEAC1L	RAIM	6 HOURS
CHANNEL INFLOW(RUNOFF)	HEAC1L	INFW	6 HOURS
AREAL EXTENT OF SNOW	HEAC1L	SASC	24 HOURS
RUNOFF COMPONENTS	HEAC1L	ROCL	24 HOURS
SOIL STORAGE CONTENTS	HEAC1L	SMZC	24 HOURS

SUMS OF WATER BALANCE VARIABLES ARE STORED.

PARAMETER VALUES - CAPACITIES ARE IN MM.

PX-ADJ	PE-ADJ	UZWIM	UZFWIM	UZK	PCTIM	ADIMP	RIVA	EFC
1.000	1.000	60.	20.	.350	.010	.043	.020	.200
PBASE	ZPERC	REXP	LZTWM	LZFSC	LZFPM	LZSK	LZPK	PFREE
15.8	8.0	1.90	140.	100.	125.	.1500	.0060	.20

16TH OF MONTH VALUES

	1	2	3	4	5	6	7	8
ET-DEMAND-MM/DAY	1.2	1.3	1.6	2.4	3.7	6.6	8.1	8.1

SOIL-MOISTURE CONTENTS(MM) FOR HEALDSBURG LOCAL

UZWIM	UZFWIM	LZTWC	LZFSC	LZFPC	ADIMC
13.	.0	96.	.0	69.	100.

Operations Table

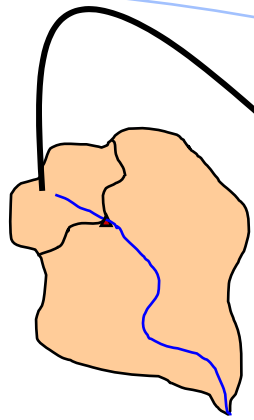
HEAC1

RSNWELEV HEAC1L
SNOW-17 HEAC1L
SAC-SMA HEAC1L
CLEAR-TS
UNIT-HG HEAC1L
CHANGE-T HEAC1_1
CLEAR-TS
LAG/K HOPC1
CLEAR-TS
ADD/SUB HOPC1R
ADD/SUB HEAC1L
CHANLOSS HEAC1
ADJUST-Q HEAC1
CHANGE-T SQIN_6
CHANGE-T QINE_6
CHANGE-T HOPC1_6
PLOT-TUL HEAC1INS
STAGE-Q HEAC1

Show

Further Sub-Division Of Basin

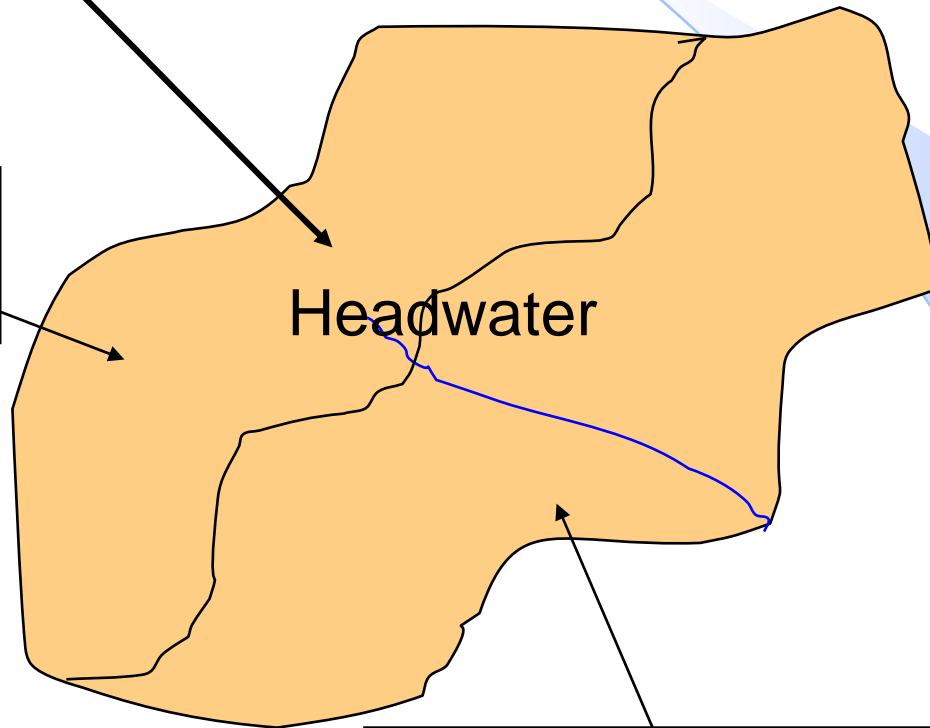
**Each Basin May Be Sub-Divided
Into More Areas Depending Upon
Elevation And Modeled Differently**

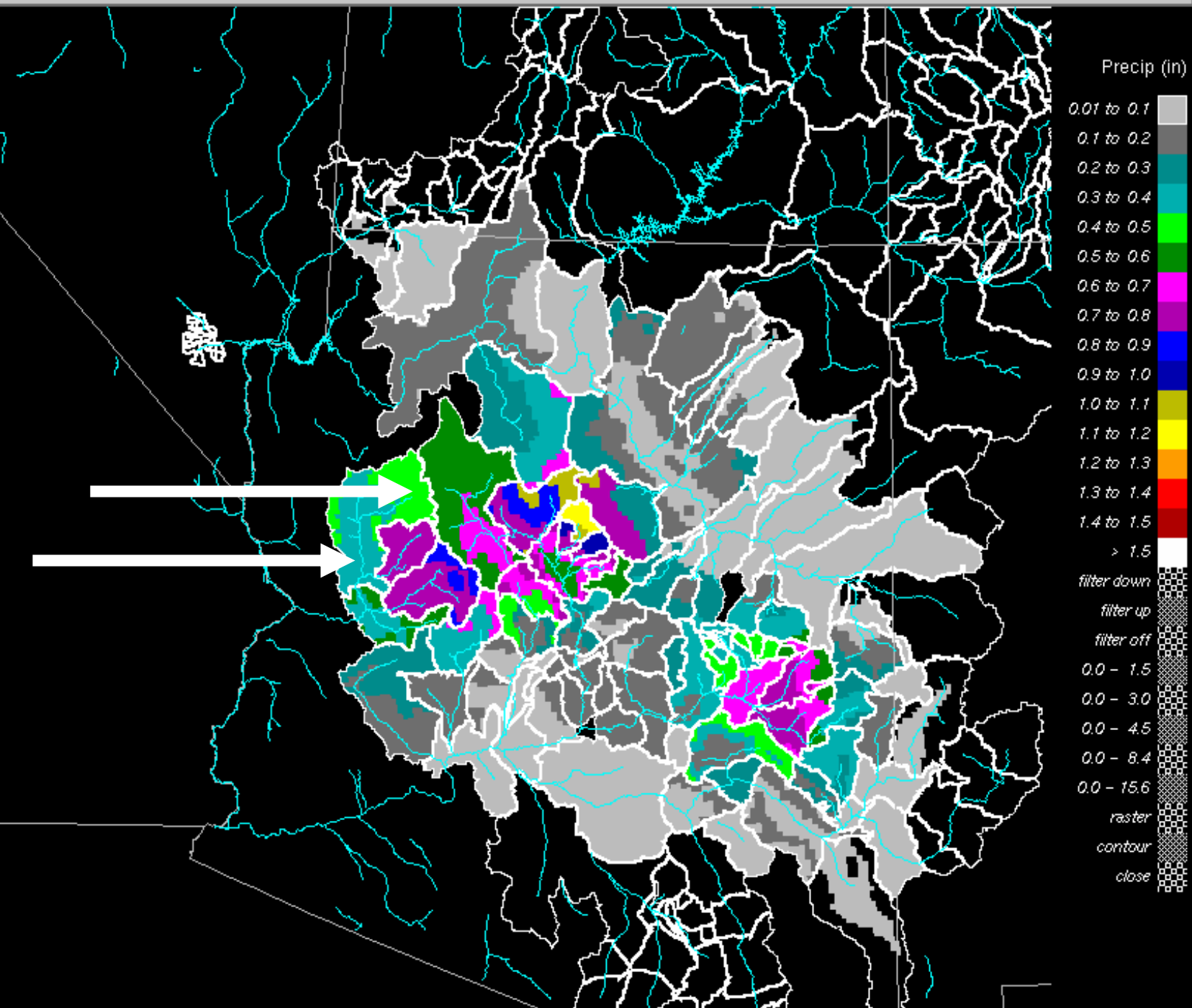


**High Elevation
Alpine Area**

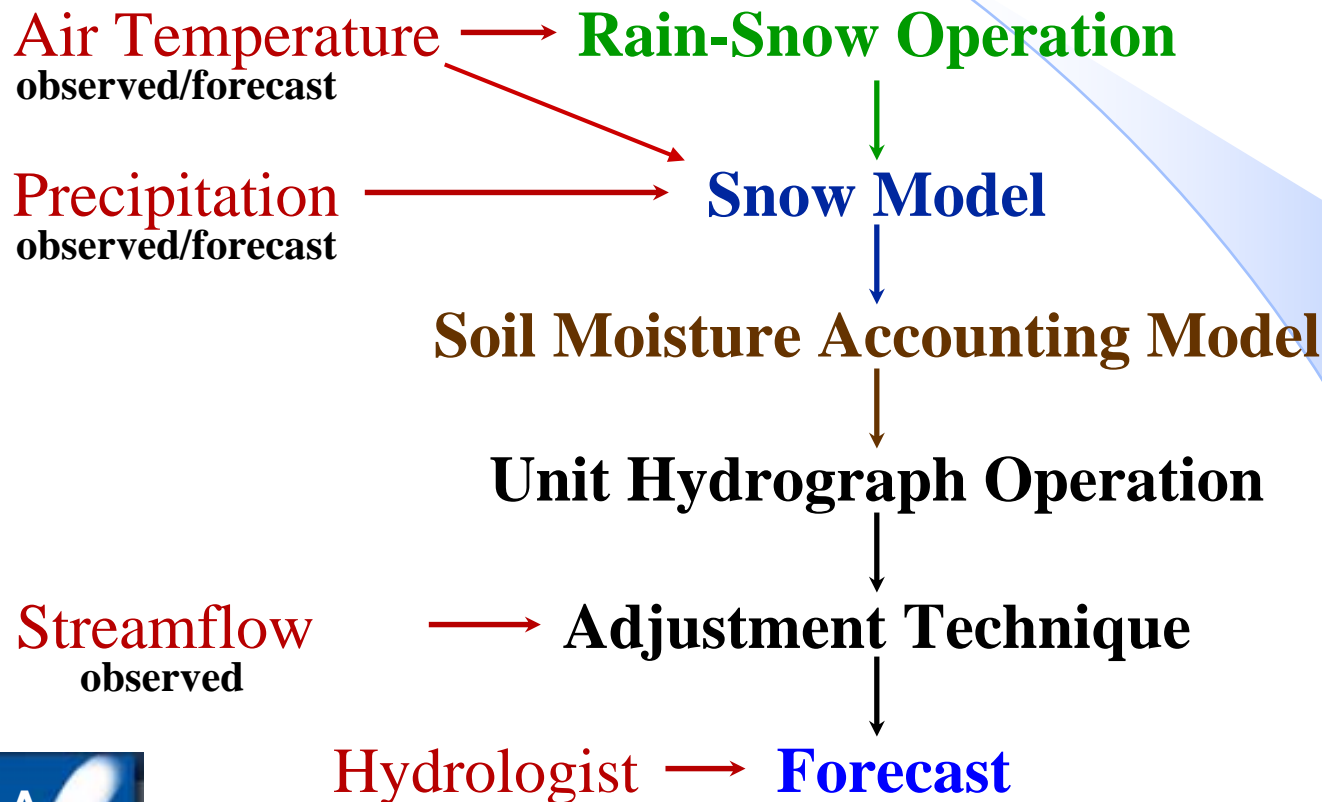
Headwater

Low Elevation Area





Typical Watershed Configuration For Each Area in the Basin

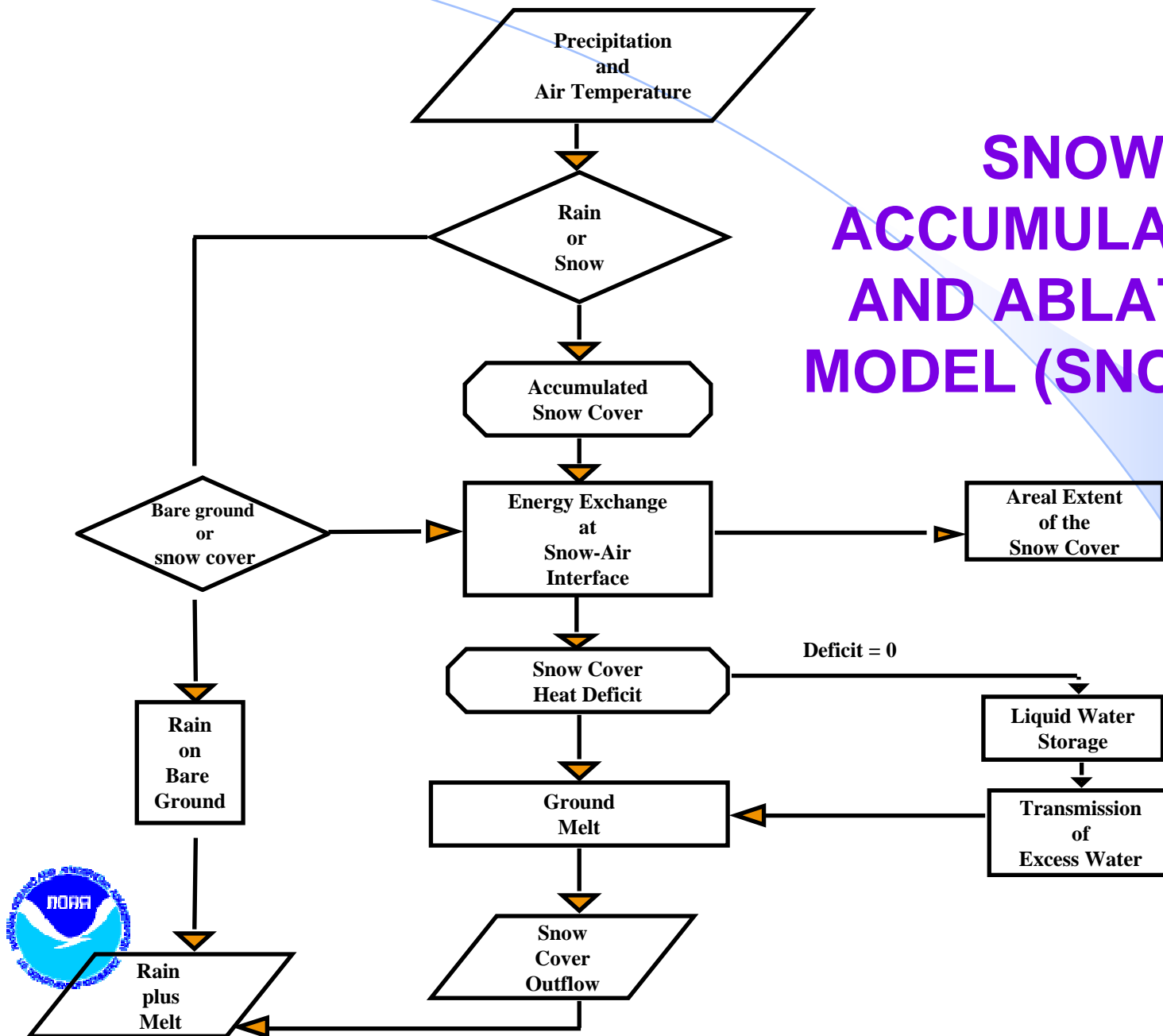


Two of the Most Widely Used Models by Most RFCs

- SNOW-17 Model
 - Simple Inputs –
Precipitation/Temperature
 - Requires Calibration
- Sacramento Soil Moisture
Accounting Model (SACCSMA)
Conceptual Model
Requires Calibration



SNOW ACCUMULATION AND ABLATION MODEL (SNOW-17)



Sacramento Soil Moisture Accounting Model

